INCREASED OUTER PLANET SCIENCE PAYLOAD USING HYBRID BALLUTE/AEROSHELL ENTRY SYSTEMS

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Half of the Galileo entry probe mass was heat shield ablation material that was required to safely decelerate the science payload. For future outer planet entry probe missions it is desirable to increase the fraction of science payload mass. A hybrid entry system that could achieve this performance is discussed. A hybrid entry system will be discussed that would use a ballute to reduce the entry system performance requirements for Jupiter, Saturn and Neptune entry probes. An entry probe system is assumed similar in mass to the Jupiter Galileo probe. The premise is that a ballute, as part of the entry system, can decelerate the probe at a lower atmospheric density to a lower velocity before substantial probe convective and radiative heating occurs, which can result in an increased mass of science payload as a fraction of the entry systems mass. In addition, the design of the probe, ballute, heat shield and descent package can possibly be optimized using reduced performance technologies for the same entry mass. Entry trajectories will be explored for a range of ballute size, entry angle, and release point. Convective and radiative heating, based on Galileo probe predictions and results, will be evaluated. The corresponding heat shield requirements and ballute and entry probe system mass will be evaluated, and the design and implementation will be discussed.